



SAR TEST REPORT

Test Report No. : 27KE0242-HO-C

Applicant : **silex Technology, Inc.**
Type of Equipment : **Mini PCI Wireless LAN Board**
Model No. : **SX-10WAG**
FCC ID : **N6C-SX10WAG**
Test standard : **FCC47CFR 2.1093**
FCC OET Bulletin 65, Supplement C
Test Result : **Complied**

Max. SAR Value

IEEE802.11a (5180-5320MHz Band) : 0.440W/kg (Body, 5260MHz)

IEEE802.11a (5745-5825MHz Band) : 0.450W/kg (Body, 5825MHz)

1. This test report shall not be reproduced except full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above standard. We hereby certify that the data contain a true representation of the SAR profile.
4. The test results in this test report are traceable to the national or international standards.

Date of test: August 8 to 30, 2007

Tested by:

Miyo Kishimoto
EMC Services

Hisayoshi Sato
EMC Services

Approved by :

Hironobu Shimoji
Assistant Manager of EMC
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NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
 *As for the range of Accreditation in NVLAP, you may refer to the WEB address, <http://uljapan.co.jp/emc/nvlap.htm>

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SECTION 1: Client information

Company Name : silex Technology, Inc.
Address : 15-15Takaida higashiosaka Osaka Japan
Telephone Number : +81- 6-6784-3758
Facsimile Number : +81- 6-6784-3750
Contact Person : Toshiro Kometani

SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment : Mini PCI Wireless LAN Board
Model No. : SX-10WAG
Serial No. : 008092-011009
Rating : DC3.3V
Country of Manufacture : JAPAN
Receipt Date of Sample : August 6, 2007
Condition of EUT : Production prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT : No modification by the test lab.
Category Identified : Portable device

2.2 Product Description

Model: SX-10WAG (referred to as the EUT in this report) is MiniPCI Wireless LAN Board.
It is integrated into a WIRELESS TRANSMITTER.

Equipment Type : Transceiver
Clock frequency : 40MHz
Method of Frequency Generation : Crystal
Operating voltage (inner) : DC3.3V +/-10%

	IEEE802.11b	IEEE802.11g	IEEE802.11a
Frequency of operation	2412-2462MHz	2412-2462MHz	5180-5320MHz 5745-5825MHz
Type of modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK)
Channel spacing	5MHz	5MHz	20MHz
ITU Code	G1D	D1D	D1D
Antenna type	Omni-Directional	Omni-Directional	Omni-Directional
Antenna Gain	1.5dBi	1.5dBi	2.1dBi

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SECTION 3 : Test standard information

3.1 Requirements for compliance testing defined by the FCC

The US Federal Communications Commission has released the report and order "Guidelines for Evaluating the Environmental Effects of RF Radiation", ET Docket No. 93-62 in August 1996. The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 1.6 mW/g for an uncontrolled environment and 8.0 mW/g for an occupational/controlled environment as recommended by the ANSI/IEEE standard C95.1-1992. According to the Supplement C of OET Bulletin 65 "Evaluating Compliance with FCC Guide-lines for Human Exposure to Radio frequency Electromagnetic Fields", released on Jun 29, 2001 by the FCC, the device should be evaluated at maximum output power (radiated from the antenna) under "worst-case" conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

1 Specific Absorption Rate (SAR) is a measure of the rate of energy absorption due to exposure to an RF transmitting source (wireless portable device).

2 IEEE/ANSI Std. C95.1-1992 limits are used to determine compliance with FCC ET Docket 93-62.

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3.2 Exposure limit

(A) Limits for Occupational/Controlled Exposure (W/kg)

Spatial Average (averaged over the whole body)	Spatial Peak (averaged over any 1g of tissue)	Spatial Peak (hands/wrists/feet/ankles averaged over 10g)
0.4	8.0	20.0

(B) Limits for General population/Uncontrolled Exposure (W/kg)

Spatial Average (averaged over the whole body)	Spatial Peak (averaged over any 1g of tissue)	Spatial Peak (hands/wrists/feet/ankles averaged over 10g)
0.08	1.6	4.0

Occupational/Controlled Environments: are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure, (i.e. as a result of employment or occupation).

General Population/Uncontrolled Environments: are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

<p style="text-align: center;">NOTE:GENERAL POPULATION/UNCONTROLLED EXPOSURE SPATIAL PEAK(averaged over any 1g of tissue) LIMIT 1.6 W/kg</p>

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SECTION 4 : Test result

4.1 Result of Max. SAR value

Max. SAR Value

IEEE802.11a (5180-5320MHz Band) : 0.440W/kg (Body, 5260MHz)

IEEE802.11a (5745-5825MHz Band) : 0.450W/kg (Body, 5825MHz)

4.2 Test Location

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SECTION 5 : Operation of E.U.T. during testing

5.1 Confirmation before SAR testing

5.1.1 Correlation of Output Power between EMC and SAR tests

EMC Power<(Sample S/N:ES0002 and 0080923A9A00 / May 17 and June 14, 2006)>

Peak Transit Power/Maximum Peak Output Power test

As for the Peak Transit Power and Maximum Peak Output Power, the data is shown as a reference data.
The result is shown in section 7.1.

SAR Power <(Sample S/N: 008092-011009 / Test date: August 8,2007)>

The test was performed before SAR test.

Since this host device can be using antenna A port only ,the SAR power was tested in the antenna A port.

Peak Transit Power/Maximum Peak Output Power test

It was checked that the antenna port power is correlated within 0~+5% (FCC requirements) at EMC test result
Peak Transit Power and Maximum Peak Output Power were tested by the same measurement method as EMC test.

Average Power test

The average power by the data rate was checked in the middle channel (5260MHz and 5765MHz)
The result is shown in section 7.2.

5.2 Confirmation after SAR testing

It was checked that the power drift is within $\pm 5\%$ in the evaluation procedure of SAR testing.
The result is shown in APPENDIX 2.

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5.3 Operating modes for SAR testing

5.3.1 Setting of EUT

1. IEEE 802.11a Low band mode

Tx frequency band : 5180 –5320MHz
Channel : 36ch(5180MHz),52ch(5260MHz),64ch(5320MHz)
Modulation : OFDM (BPSK,QPSK,16QAM,64QAM)
Crest factor : 1

2. IEEE 802.11a High band mode

Tx frequency band : 5745 –5825MHz
Channel : 149ch(5745MHz),153ch(5765MHz),165ch(5825MHz)
Modulation : OFDM (BPSK,QPSK,16QAM,64QAM)
Crest factor : 1

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5.3.2 SAR Measurement (Radiated power is always monitored by Spectrum Analyzer.)

1. IEEE 802.11a Low band

The tests from Step1 to Step4 were performed.

Step1. The searching for the worst position

The data rate in the higher average power* of each modulation was decided, then the worst modulation was searched in the SAR testing.

Step2. The searching for the worst position

This test was performed at the worst condition of Step1.

Step3. The changing to the Low and High channels

This test was performed at the worst conditions of Step2.

Step4. The confirmation in the condition with accessory (Case)

This test was performed in the conditions of Antenna up and Antenna down.

2. IEEE 802.11a High band

The tests from Step5 to Step8 were performed.

Step5. The searching for the worst position

The data rate in the higher average power* of each modulation was decided, then the worst modulation was searched in the SAR testing.

Step6. The searching for the worst position

This test was performed at the worst modulation of Step5.

Step7. The changing to the Low and High channels

This test was performed at the worst conditions of Step6.

Step8. The confirmation in the condition with accessory (Case)

This test was performed in the conditions of Antenna up and Antenna down.

Step9. The confirmation in the condition without accessory (Case).

This test was performed at the worst conditions of from Step 1 to Step 8.

The measurement was performed with the distance 15mm to check the effect of accessory.

* Refer to the average power data to Section 7.2.

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5.4 Test setup of EUT

When users operate or carry the EUT, it could be considered to touch or get close to their bodies. In order to assume this situation, we performed the test at the following positions. Please refer to "Appendix 1" for more details.

(1) Rear(Ant.down):

The test was performed in touch with rear surface of host device to the flat phantom.
The distance between the downed antenna and flat phantom is 10mm.

(2) Rear(Ant.up):

The test was performed in touch with rear surface of host device to the flat phantom.
The distance between the antenna and flat phantom is 10mm.

(3) Right Side(Ant.down):

The test was performed in touch with top of downed antenna to the flat phantom.

(4) Front(Ant.down): *1

The test was performed in touch with front surface of host device to the flat phantom.
The distance between the downed antenna and flat phantom is 13mm.

(5) Left Side(Ant.down): *1

The test was performed in touch with left side of host device to the flat phantom.
The distance between the downed antenna and flat phantom is 15mm.

(6) Left Side(Ant.up): *1

The test was performed in touch with left side of host device to the flat phantom.
The distance between the antenna and flat phantom is 15mm.

(7) Rear(Ant.down) with case:

The test was performed in touch with rear surface of host device with case to the flat phantom.
The distance between the downed antenna and flat phantom is 15mm.

(8) Rear(Ant.up) with case:

The test was performed in touch with rear surface of host device with case to the flat phantom.
The distance between the antenna and flat phantom is 15mm.

(9) Rear(Ant.down) (separation 15mm):

The measurement was a distance of 15mm between the downed antenna of host device and flat phantom.
The host device was rear surface position.

(10) Top (Ant.down): *2

The test was performed in touch with top of antenna to the flat phantom.

(11) Top (Ant.up): *2

The test was performed in touch with side of downed antenna the flat phantom.

*1: These positions were tested in the 11a Low band only.

*2: These positions were tested as a reference.

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SECTION 6 : Test surrounding

6.1 Measurement uncertainty

The uncertainty budget has been determined for the DASY4 measurement system according to the SPEAG documents[6][7] and is given in the following Table.

Error Description	Uncertainty value \pm %	Probability distribution	divisor	(ci) 1g	Standard Uncertainty (1g)	vi or v _{eff}
Measurement System						
Probe calibration	± 6.8	Normal	1	1	± 6.8	∞
Axial isotropy of the probe	± 4.7	Rectangular	$\sqrt{3}$	$(1-cp)^{1/2}$	± 1.9	∞
Spherical isotropy of the probe	± 9.6	Rectangular	$\sqrt{3}$	$(cp)^{1/2}$	± 3.9	∞
Boundary effects	± 2.0	Rectangular	$\sqrt{3}$	1	± 1.2	∞
Probe linearity	± 4.7	Rectangular	$\sqrt{3}$	1	± 2.7	∞
Detection limit	± 1.0	Rectangular	$\sqrt{3}$	1	± 0.6	∞
Readout electronics	± 0.3	Normal	1	1	± 0.3	∞
Response time	± 0.8	Rectangular	$\sqrt{3}$	1	± 0.5	∞
Integration time	± 2.6	Rectangular	$\sqrt{3}$	1	± 1.5	∞
RF ambient Noise	± 3.0	Rectangular	$\sqrt{3}$	1	± 1.7	∞
RF ambient Reflections	± 3.0	Rectangular	$\sqrt{3}$	1	± 1.7	∞
Probe Positioner	± 0.8	Rectangular	$\sqrt{3}$	1	± 0.5	∞
Probe positioning	± 9.9	Rectangular	$\sqrt{3}$	1	± 5.7	∞
Max.SAR Eval.	± 4.0	Rectangular	$\sqrt{3}$	1	± 2.3	∞
Test Sample Related						
Device positioning	± 2.9	Normal	1	1	± 2.9	23
Device holder uncertainty	± 3.6	Normal	1	1	± 3.6	10
Power drift	± 5.0	Rectangular	$\sqrt{3}$	1	± 5.8	∞
Phantom and Setup						
Phantom uncertainty	± 4.0	Rectangular	$\sqrt{3}$	1	± 2.3	∞
Liquid conductivity (target)	± 5.0	Rectangular	$\sqrt{3}$	0.64	± 1.8	∞
Liquid conductivity (meas.)	± 5.0	Rectangular	1	0.64	± 3.2	∞
Liquid permittivity (target)	± 5.0	Rectangular	$\sqrt{3}$	0.6	± 1.7	∞
Liquid permittivity (meas.)	± 5.0	Rectangular	1	0.6	± 3.0	∞
Combined Standard Uncertainty					± 13.48	
Expanded Uncertainty (k=2)					± 26.96	

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SECTION 7 : Confirmation before testing

7.1 EMC power and SAR power(WLAN IEEE802.11a)

EMC power

This data is reference data of EMC test. (Report No. 26GE0351-HO-B)

FCC15.407 Peak Transmit Power

Date of test: May 17 and June 14, 2006

ANT:A 54Mbps

Ch	Freq. [MHz]	S/A Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]
36	5180.0	-1.46	4.10	10.00	12.64
48	5240.0	-1.81	4.10	10.00	12.29
64	5320.0	-1.65	4.10	10.00	12.45
149	5745.0	-0.50	4.10	10.00	13.60
153	5765.0	-0.67	4.10	10.00	13.43
161	5805.0	-0.72	4.10	10.00	13.38

FCC15.247 Maximum Peak Output Power

Date of test: July 8, 2006

ANT:A 54Mbps

Ch	Freq. [MHz]	S/A Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]
165	5825.0	-1.12	4.10	10.00	12.98

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SAR Power

Date of test: August 8, 2007

ANT:A 54Mbps

Ch	Freq. [MHz]	S/A Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]
36	5180.0	1.09	1.57	10.17	12.83
48	5240.0	0.75	1.55	10.15	12.45
52	5260.0	0.71	1.55	10.15	12.41
64	5320.0	0.98	1.53	10.13	12.64
149	5745.0	1.65	1.95	10.09	13.69
153	5765.0	1.49	1.97	10.09	13.55
161	5805.0	1.44	2.00	10.09	13.53
165	5825.0	1.02	2.02	10.09	13.13

7.2 Reference data of SAR test (Data rate determing)

Date of test: August 8, 2007

Ant:A					
Data rate [Mbps]	Freq. [MHz]	P/M Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]
6	5260.0	0.21	1.55	10.15	11.91
9	5260.0	0.33	1.55	10.15	12.03
12	5260.0	0.35	1.55	10.15	12.05
18	5260.0	0.36	1.55	10.15	12.06
24	5260.0	0.29	1.55	10.15	11.99
36	5260.0	0.34	1.55	10.15	12.04
48	5260.0	0.38	1.55	10.15	12.08
54	5260.0	0.48	1.55	10.15	12.18
6	5765.0	1.34	1.97	10.09	13.40
9	5765.0	1.37	1.97	10.09	13.43
12	5765.0	1.37	1.97	10.09	13.43
18	5765.0	1.37	1.97	10.09	13.43
24	5765.0	1.43	1.97	10.09	13.49
36	5765.0	1.46	1.97	10.09	13.52
48	5765.0	1.50	1.97	10.09	13.56
54	5765.0	1.78	1.97	10.09	13.84

Sample Calculation: Result = Reading + Cable Loss + Attenuator Loss

*The test result is round off to one or two decimal places, so some differences might be observed.

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SECTION 8 : Measurement results

8.1 5GHz SAR (11a Low band mode)

Date : August 8 2007 Measured By : Miyo Kishimoto
Liquid Depth (cm) : 15.0 Model : SX-10WAG
Parameters : $\epsilon_r = 46.7, \sigma = 5.46$ Serial No. : 008092-011009
Ambient temperature (deg.c.) : 24.5 Modulation : OFDM
Relative Humidity (%) : 60 Crest factor : 1

SAR MEASUREMENT RESULTS									
Frequency			Modulation (Data rate[bps])	EUT Set-up Conditions			Liquid Temp.[deg.c]		SAR(1g) [W/kg]
Mode	ch	[MHz]		Antenna	Position	Separation [mm]	Before	After	Maximum value of multi-peak
11a Low Band	Step1. The searching for the worst position								
	52	5260	BPSK(9Mbps)	Ant.A	Rear (Ant.down)	10	23.3	23.3	0.324
	52	5260	QPSK(18Mbps)	Ant.A	Rear (Ant.down)	10	23.3	23.3	0.310
	52	5260	16QAM(36Mbps)	Ant.A	Rear (Ant.down)	10	23.3	23.3	0.440
	52	5260	64QAM(54Mbps)	Ant.A	Rear (Ant.down)	10	23.3	23.3	0.250
	Step2. The searching for the worst position								
	52	5260	16QAM(36Mbps)	Ant.A	Rear (Ant.up)	10	23.3	23.4	0.299
	52	5260	16QAM(36Mbps)	Ant.A	Right Side (Ant.down)	0	23.4	23.4	0.032
	52	5260	16QAM(36Mbps)	Ant.A	Front (Ant.down)	13	23.4	23.4	0.188
	52	5260	16QAM(36Mbps)	Ant.A	Left Side (Ant.down)	15	23.4	23.4	0.086
	52	5260	16QAM(36Mbps)	Ant.A	Left Side (Ant.up)	15	23.4	23.4	0.107
	Step3. The changing to the Low and High channels								
	36	5180	16QAM(36Mbps)	Ant.A	Rear (Ant.down)	10	23.4	23.4	0.293
	64	5320	16QAM(36Mbps)	Ant.A	Rear (Ant.down)	10	23.4	23.4	0.339
	Step 4. The confirmation of host device with accessory(Case)								
	52	5260	16QAM(36Mbps)	Ant.A	Rear (Ant.down)	15	23.3	23.3	0.146
	52	5260	16QAM(36Mbps)	Ant.A	Rear (Ant.up)	15	23.3	23.3	0.135
	ANSI / IEEE C95.1 1992 - SAFETY LIMIT							Body SAR: 1.6 W/kg	
Spatial Peak Uncontrolled Exposure / General Population							(averaged over 1 gram)		

8.2 5GHz SAR (11a High band mode)

Date : August 9, 2007 Measured By : Miyo Kishimoto
Liquid Depth (cm) : 15.0 Model : SX-10WAG
Parameters : $\epsilon_r = 46.7, \sigma = 6.27$ Serial No. : 008092-011009
Ambient temperature (deg.c.) : 24.5 Modulation : OFDM
Relative Humidity (%) : 52 Crest factor : 1

SAR MEASUREMENT RESULTS									
Frequency			Modulation (Data rate[bps])	EUT Set-up Conditions			Liquid Temp.[deg.c]		SAR(1g) [W/kg]
Mode	ch	[MHz]		Antenna	Position	Separation [mm]	Before	After	Maximum value of multi-peak
11a High Band	Step5. The searching for the worst position								
	153	5765	BPSK(9Mbps)	Ant.A	Rear (Ant.down)	10	23.7	24.0	0.314
	153	5765	QPSK(18Mbps)	Ant.A	Rear (Ant.down)	10	24.0	24.0	0.391
	153	5765	16QAM(36Mbps)	Ant.A	Rear (Ant.down)	10	24.0	24.0	0.409
	153	5765	64QAM(54Mbps)	Ant.A	Rear (Ant.down)	10	24.0	24.0	0.439
	Step6. The searching for the worst position								
	153	5765	64QAM(54Mbps)	Ant.A	Rear (Ant.up)	10	24.0	23.7	0.416
	153	5765	64QAM(54Mbps)	Ant.A	Right Side (Ant.down)	0	24.0	24.0	0.025
	153	5765	64QAM(54Mbps)	Ant.A	Front (Ant.down)	13	-	-	- *1
	153	5765	64QAM(54Mbps)	Ant.A	Left Side (Ant.down)	15	-	-	- *1
	153	5765	64QAM(54Mbps)	Ant.A	Left Side (Ant.up)	15	-	-	- *1
	Step7. The changing to the Low and High channels								
	149	5745	64QAM(54Mbps)	Ant.A	Rear (Ant.down)	10	23.5	23.5	0.406
	165	5825	64QAM(54Mbps)	Ant.A	Rear (Ant.down)	10	23.5	23.5	0.450
	Step 8. The confirmation of host device with accessory(Case)								
	165	5825	64QAM(54Mbps)	Ant.A	Rear (Ant.down)	15	23.5	23.5	0.151
	165	5825	64QAM(54Mbps)	Ant.A	Rear (Ant.up)	15	23.5	23.5	0.175
	Step 9. The confirmation of host device without accessory(Case)								
	165	5825	64QAM(54Mbps)	Ant.A	Rear (Ant.down)	15	23.5	23.5	0.122
ANSI / IEEE C95.1 1992 - SAFETY LIMIT							Body SAR: 1.6 W/kg		
Spatial Peak Uncontrolled Exposure / General Population							(averaged over 1 gram)		

*1 These positions were not tested because SAR values of these positions were lower than SAR value of "Rear" position in the 11a Low band test. In addition the separations of these positions were longer than "Rear" position.

8.3 Reference data 5GHz SAR (11a Low band mode & High band mode)

Date : **August 30 2007** Measured By : **Hisayoshi Sato**
Liquid Depth (cm) : **15.0** Model : **SX-10WAG**
Parameters : **$\epsilon_r = 47.1, \sigma = 5.09$ (Low band)**
 $\epsilon_r = 48.2, \sigma = 6.00$ (High band)
Serial No. : **008092-011009**
Ambient temperature (deg.c.) : **25.0** Modulation : **OFDM**
Relative Humidity (%) : **56** Crest factor : **1**

SAR MEASUREMENT RESULTS									
Frequency			Modulation (Data rate[bps])	EUT Set-up Conditions			Liquid Temp.[deg.c]		SAR(1g) [W/kg]
Mode	ch	[MHz]		Antenna	Position	Separation [mm]	Before	After	Maximum value of multi-peak
11a	Reference data								
Low	52	5260	16QAM(36Mbps)	Ant.A	Top (Ant.down)	0	24.5	24.5	1.16
Band	52	5260	16QAM(36Mbps)	Ant.A	Top (Ant.up)	0	24.5	24.5	0.038
11a	Reference data								
High	153	5765	64QAM(54Mbps)	Ant.A	Top (Ant.down)	0	24.5	24.5	1.42
Band	153	5765	64QAM(54Mbps)	Ant.A	Top (Ant.up)	0	24.5	24.5	0.035
ANSI / IEEE C95.1 1992 - SAFETY LIMIT							Body SAR: 1.6 W/kg		
Spatial Peak Uncontrolled Exposure / General Population							(averaged over 1 gram)		